



Verification of Environmental Monitoring Technologies

Technology Profile: Portable NO/NO₂ Emission Analyzers

Brief Description

Portable NO/NO₂ emission analyzers are used to measure nitrogen oxide and nitrogen dioxide (NO/NO₂) emissions from sources such as reciprocating engines, combustion turbines, furnaces, boilers, stoves, and water heaters that use fuels such as natural gas, propane, butane, and fuel oil. The size and weight of the analyzers varies, but to qualify as "portable," they must weigh less than 50 pounds, be the size of about one cubic foot or less, and have a minimal need for expendable supplies. These devices, capable of being operated by a single person at multiple locations in a single day, use only 110V AC electrical power or self-contained battery power. These analyzers have been commercially available for approximately 10 years.

The analyzers use one of two methods to detect NO/NO₂ emissions: (1) electrochemical (EC) sensors, or (2) chemiluminescence emitted from the reaction of NO with ozone (O₃) produced within the analyzer. (Chemiluminescence is the generation of electromagnetic radiation as light by the release of energy from a chemical reaction.)

How is this important to environmental protection?

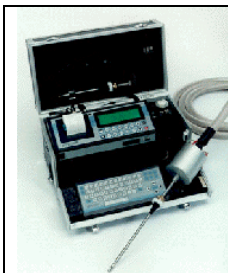
Detection of these emissions is important to environmental protection because NO/NO₂ plays a role in the formation of ozone, a major environmental pollutant. For ozone to be produced, a free oxygen atom (O) combines with a regular oxygen molecule (O₂). Sunlight can convert NO₂ into NO, releasing an O atom which can then form ozone. The ozone molecule can also react with NO to reform NO₂. In addition to its role in the formation of ozone, NO₂ is also a pulmonary (lung) irritant. Emission limitations are imposed on large sources to control NO/NO₂ releases into the atmosphere.

What federal regulatory program does this interface with?

The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six air pollutants: ozone, lead, carbon monoxide, sulfur dioxide, nitrogen dioxide, and respirable particulate matter. The standards were established to protect the public from exposure to harmful amounts of pollutants. Individual states also have ambient standards for NO₂.

Whose technologies have been verified?

The vendors and technologies verified in these tests included:



ECOM A-Plus
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Enerac 3000E
**Enerac Division of
Energy Efficiency
Systems, Inc.**
1300 Shames Dr.
Westbury, NY 11590
Web: www.enerac.com
E-mail: ees@enerac.com
Contact: Robert Gasser
Phone: 508-836-4220



Horiba PG-250
Horiba Instruments, Inc.
17671 Armstrong Ave.
Irvine, CA 92614
Web: www.horiba.com
E-mail: info@horiba.com
Contact: Dave Vojtko
Phone: 724-457-2424



Testo Model 350
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Web: www.testo.com
E-mail: info@testo.com
Contact: Craig McKim
Phone: 973-252-1720



TSI Combucheck
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Contact: Mel Findlay
Phone: 651-490-4067

Additional NO/NO₂ analyzers can be verified for other interested vendors.

General Market Information

How much does it cost to purchase a portable NO/NO₂ emission analyzer?

Prices for these analyzers vary widely, but the average cost is \$10-12,000 per instrument. The cost depends upon the capabilities of the instruments (e.g., is it multi-functional, does it have a sampling probe and data output capability?).

Who would use it or who are the customers who would buy it?

Portable NO/NO₂ analyzers are commonly used to check for the efficient operation of, or leaks from, natural gas powered equipment or home combustion sources, to conduct spot checks on pollution control equipment, and for periodic monitoring of emissions from other sources. Customers who would buy the analyzers include natural gas utility workers, safety engineers, regulatory inspectors, and companies that use gas-powered equipment.

General Test Information

Which ETV pilot is evaluating portable NO/NO₂ emission analyzers?

The Advanced Monitoring Systems (AMS) pilot, which is one of 12 pilots in the U.S. EPA's Environmental Technology Verification Program. The objective of the AMS pilot is to verify the performance of commercially ready advanced monitoring technologies for air, water, and soil. For the AMS pilot, the U.S. EPA has selected Battelle as its partner. [Battelle](#), a not-for-profit technology research and development organization, designs and conducts the tests at appropriate sites.

What are the factors verified in these tests?

The test plan for portable NO/NO₂ emission analyzers is available on the ETV web site at http://www.epa.gov/etv/07/07_prot.htm. The verification test for NO/NO₂ analyzers involves both laboratory tests, in which the analyzers are challenged with NO and NO₂ under various test conditions, and source tests, which compare each instrument's performance with chemiluminescent measurements that are the basis of EPA Method 7E. The performance characteristics verified in these tests included:

Linearity
Response Time
Interferences
Temperature Sensitivity
Inter-Unit Repeatability

Detection Limit
Zero/Span Drift
Pressure Sensitivity
Relative Accuracy

When were the tests conducted?

The first verification tests of NO/NO₂ analyzers were conducted in January-February 1999 at Battelle's laboratories in Columbus, OH. Verification statements and verification reports are available on the ETV web site at www.epa.gov/etv/library.htm.

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